REMARKS

Reconsideration and allowance of the above-referenced application are respectfully requested.

Claims 2, 3, 5-30 and 35-44 stand rejected under 35 USC 102(e) as allegedly being anticipated by the previous Yamazaki patent '541. Claim 4 stands rejected under 35 USC 103(a) as being unpatentable over Yamazaki '541 in view of Lee '320. Claims 31-34 stand rejected under 35 USC 103(a) as allegedly being unpatentable over Yamazaki '541 in view of Wolf. These contentions have been obviated by the amendment of the claims herewith to better emphasize the patentable distinctions of the present invention.

Initially, two minor changes are made to page 16 of the specification, to correct "N" to --P--. One of ordinary skill in the art would have understood this, and hence this correction is not based on new matter.

The present invention defines a semiconductor device having a special channel formation region which is crystallized by irradiation of laser light. The Patent Office has stated, correctly, that a product by process limitation is met by structure directed to the product per se. However, it is respectfully suggested that the product per se here is in fact different because of the way the product is formed. This is a

reason for using a product by process claim, and it is respectfully suggested that all of these claims should be in condition for allowance.

In general, a semiconductor film is crystallized by irradiating using laser light. This forms ridges on the crystallized semiconductor film. The ridges are formed because the semiconductor film has been slightly melted and crystallized by laser irradiation. It has been found that the existence of the ridges effects the electrical characteristics of the semiconductor device. See generally, in the specification, page 5, line 26-page 6, line 3.

The present application teaches a semiconductor device having a channel formation region which has been crystallized by irradiation of the laser light, but where the ridges are less than 500 Å. In previous systems where the channel formation region of this type is formed, the ridges were greater than 500 Å. Therefore, the present application is respectfully suggested to be in condition for allowance.

In Yamazaki '541, a semiconductor film is crystallized by heating at 550°C for 8 hours. See column 7, lines 1-3. This is an entirely different crystallization method than the present application. Therefore, it is respectfully suggested that the semiconductor film that is defined by the claims of the present

application is structurally different than the semiconductor film that has been crystallized using the teachings of Yamazaki '541. For example, it is believed that ridges would be observed in the laser crystallized semiconductor film, but not in the Yamazaki crystallized semiconductor film. Therefore, it is respectfully suggested that the present application is structurally different than Yamazaki, and for these reasons, all of the rejections should be obviated.

The secondary references to Lee and Wolf do not supply the missing teaching described above. Therefore, even assuming that Lee teaches exactly what is stated by the rejection, Yamazaki in view of Lee still would not render obvious claim 4, since the basic material would be structurally different than the Yamazaki-type material. Similarly, the rejection of Yamazaki in view of Wolf is respectfully traversed since the material would be different than that specified thereby. Again, Yamazaki '541 fails to disclose the claimed feature that the channel formation region is crystallized by laser irradiation and the specific height of the ridges. Therefore, the material which is now claimed is structurally different than Yamazaki, or Yamazaki in view of Lee or Yamazaki in view of Wolf.

Claims 3, 4, 11 and 24 have been amended to recite the specific material and thickness of the antireflection film and

the specific laser used for this antireflection film. This further distinguishes over the prior art.

In view of the above amendments and remarks, all of the claims should be in condition for allowance. A formal notice to that effect is respectfully solicited.

Attached is a marked-up version of the changes being made by the current amendment.

Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 9/21/01

Scott C. Harris
Reg. No. 32,030

Fish & Richardson P.C.
PTO Customer No. 20985
4350 La Jolla Village Drive, Suite 500
San Diego, California 92122
Telephone: (858) 678-5070
Facsimile: (858) 678-5099

10135415.doc

Version with markings to show changes made

In the specification:

Paragraph beginning at page 16, line 5, has been amended as follows:

As shown in Fig. 2(C), dopant ions are implanted into the active layer 107 by ion implantation techniques, using the gate electrode 111 and surrounding anodic oxide 112 as a mask. In order to fabricate a [P] N-channel TFT, phosphorus is introduced. Using phosphine (PH_3) as a dopant gas, phosphorus ions are implanted. On the other hand, in order to fabricate [an N] a P-channel TFT, boron ions are introduced, using diborane (B_2H_6) as a dopant gas. As a result, a source region 113, a drain region 114, and a channel region 115 are formed in the active layer 107 by self-aligned technology.

In the claims:

Claims 13, 26 and 29 have been cancelled.

Claims 2-7, 11, 12, 16-20, 24, 25, and 30 have been amended as follows:

2. (Twice Amended) A semiconductor device comprising:

a crystalline semiconductor island comprising silicon over a substrate, said semiconductor island comprising a source region, a drain region, and a channel formation region provided

between said source region and said drain region; and

a gate insulating film comprising a silicon oxide layer and a silicon nitride layer with said silicon nitride layer provided over said silicon oxide layer,

wherein said silicon oxide layer is provided over said crystalline semiconductor island and has a side aligned with a side of said crystalline semiconductor island, [and]

wherein said crystalline semiconductor island has a ridge on a surface of said semiconductor island, [and]

wherein said ridge is less than 500 Å over said channel formation region[.],

wherein said channel formation region is crystallized by irradiating at least the channel formation region with laser light.

3. (Twice Amended) A semiconductor device comprising:

a crystalline semiconductor layer comprising silicon over a substrate, said semiconductor layer comprising a source region, a drain region, and a channel formation region provided between said source region and said drain region;

[an insulating layer comprising a thermal oxide of said semiconductor layer, said thermal oxide being provided in contact with a surface of said semiconductor layer and

constituting a part of a gate insulating layer of said semiconductor device; and]

a gate insulating layer formed on said channel formation region, said gate insulating layer comprising silicon oxide layer;

a gate electrode provided adjacent to said channel formation region with said gate insulating layer therebetween,

[wherein said crystalline semiconductor layer has a ridge on said surface of said semiconductor layer,] and

[wherein said ridge is less than 500 Å over said channel formation region.]

wherein said channel formation region is crystallized by irradiating at least the channel formation region with KrF excimer laser light through said silicon oxide layer, and the thickness of said silicon oxide layer is from 300 to 600 Å.

4. (Twice Amended) A semiconductor device comprising:

a crystalline semiconductor layer comprising silicon over a substrate, said semiconductor layer comprising a source region, a drain region, and a channel formation region provided between said source region and said drain region with at least one lightly doped region between said channel formation region and at least one of said source region and said drain region;

[an insulating layer comprising a thermal oxide of said semiconductor layer, said thermal oxide being provided in contact with a surface of said semiconductor layer and constituting a part of a gate insulating layer of said semiconductor device; and]

a gate insulating layer formed on said channel formation region, said gate insulating layer comprising silicon nitride layer;

a gate electrode provided adjacent to said channel formation region with said gate insulating layer therebetween,

[wherein said crystalline semiconductor layer has a ridge on said surface of said semiconductor layer,] and

[wherein said ridge is less than 500 Å over said channel formation region.]

wherein said channel formation region is crystallized by irradiating at least the channel formation region with KrF excimer laser light through said silicon nitride layer, and the thickness of said silicon nitride layer is from 250-500 Å.

5. (Twice Amended) A semiconductor device comprising:

a crystalline semiconductor layer comprising silicon on an insulating surface, said semiconductor layer comprising a source region, a drain region, and a

channel formation region provided between said source region and said drain region;

wherein said crystalline semiconductor layer has a ridge on a surface of said crystalline semiconductor layer, [and]

wherein said ridge is less than 500 Å over said channel formation region[.], and

wherein said channel formation region is crystallized by irradiating at least the channel formation region with a laser light.

6. (Amended) The device of claims 5 wherein said ridge is formed by irradiating [a] said laser light to [said semiconductor layer] at least the channel formation region.

7. (Amended) The device of claim [6] 5 wherein said laser light is KrF excimer laser or XeCl excimer laser light.

11. (Twice Amended) A semiconductor device comprising:

a crystalline semiconductor layer comprising silicon on an insulating surface, said semiconductor layer comprising a source region,

a drain region, and a channel formation region provided between said source region and said drain region; and

[an insulating layer comprising silicon oxide or silicon nitride provided on said crystalline semiconductor layer, said insulating layer constituting apart of a gate insulating layer of said semiconductor device,]

a gate insulating layer formed on said channel formation region, said gate insulating film comprising a silicon oxide layer;

[wherein said crystalline semiconductor layer has a ridge on a surface of said crystalline semiconductor layer,] and

[wherein said ridge is less than 500 Å over said channel formation region.]

wherein said channel formation region is crystallized by irradiating at least the channel formation region with XeCl laser light through said silicon oxide layer and the thickness of said silicon oxide is from 400-700 Å.

12. (Amended) The device of claim 11 wherein [said] a ridge is formed on a surface of said crystalline semiconductor layer by irradiating [a] said XeCl laser light to [said semiconductor layer] at least the channel formation region.

16. (Twice Amended) The device of claim 11 wherein the silicon oxide layer [of said insulating layer] is formed by wet oxidation or hydrogen chloride oxidation.

17. (Amended) The device of claim [11] 12 wherein said ridge is less than about 200 Å.

18. (Twice Amended) A semiconductor device comprising:

a crystalline semiconductor layer comprising silicon on an insulating surface, said semiconductor layer comprising a source region, a drain region, and a channel formation region provided between said source region and said drain region,

wherein said crystalline semiconductor layer has a ridge measured by AFM on a surface of said crystalline semiconductor layer, [and]

wherein said ridge is less than 500 Å over said channel formation region[.], and

wherein said channel formation region is crystallized by irradiating at least the channel formation region with laser light.

19. (Amended) The device of claim 18 wherein said ridge is formed by irradiating [a] said laser light to [said semiconductor layer] at least the channel formation region.

20. (Amended) The device of claim [19] 18 wherein said laser light is KrF excimer laser or XeCl excimer laser light.

24. (Twice Amended) A semiconductor device comprising:

a crystalline semiconductor layer comprising silicon on an insulating surface, said semiconductor layer comprising a source region, a drain region, and a channel formation region provided between said source region and said drain region; and

[an insulating layer comprising silicon oxide or silicon nitride provided on said crystalline semiconductor layer, said insulating layer constituting apart of a gate insulating layer of said semiconductor device,]

a gate insulating layer formed on the channel formation region, said gate insulating layer comprising a silicon nitride,

[wherein said crystalline semiconductor layer has a ridge measured by AFM on a surface of said crystalline layer,] and

[wherein said ridge is less than 500 Å over said channel formation region.]

wherein said channel formation region is crystallized by irradiating at least the channel formation region with XeCl laser light through said silicon nitride layer and the thickness of said silicon nitride layer is from 350 to 600 Å.

25. (Amended) The device of claim 24 wherein [said] a ridge is formed on a surface of said crystalline semiconductor layer by irradiating [a] said XeCl laser light to [said semiconductor layer] at least the channel formation region.

30. (Amended) The device of claim [24] 25 wherein said ridge is less than about 200 Å measured by AFM.